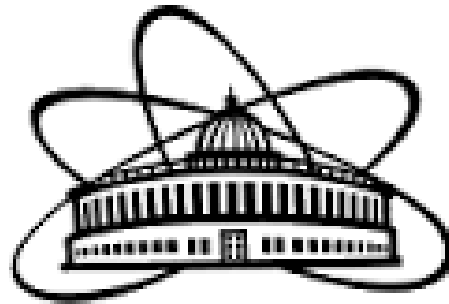


E-36: the first experiment at NAL. An example of US-USSR cooperation



Vitaly Pronskikh
Fermi National Accelerator Laboratory

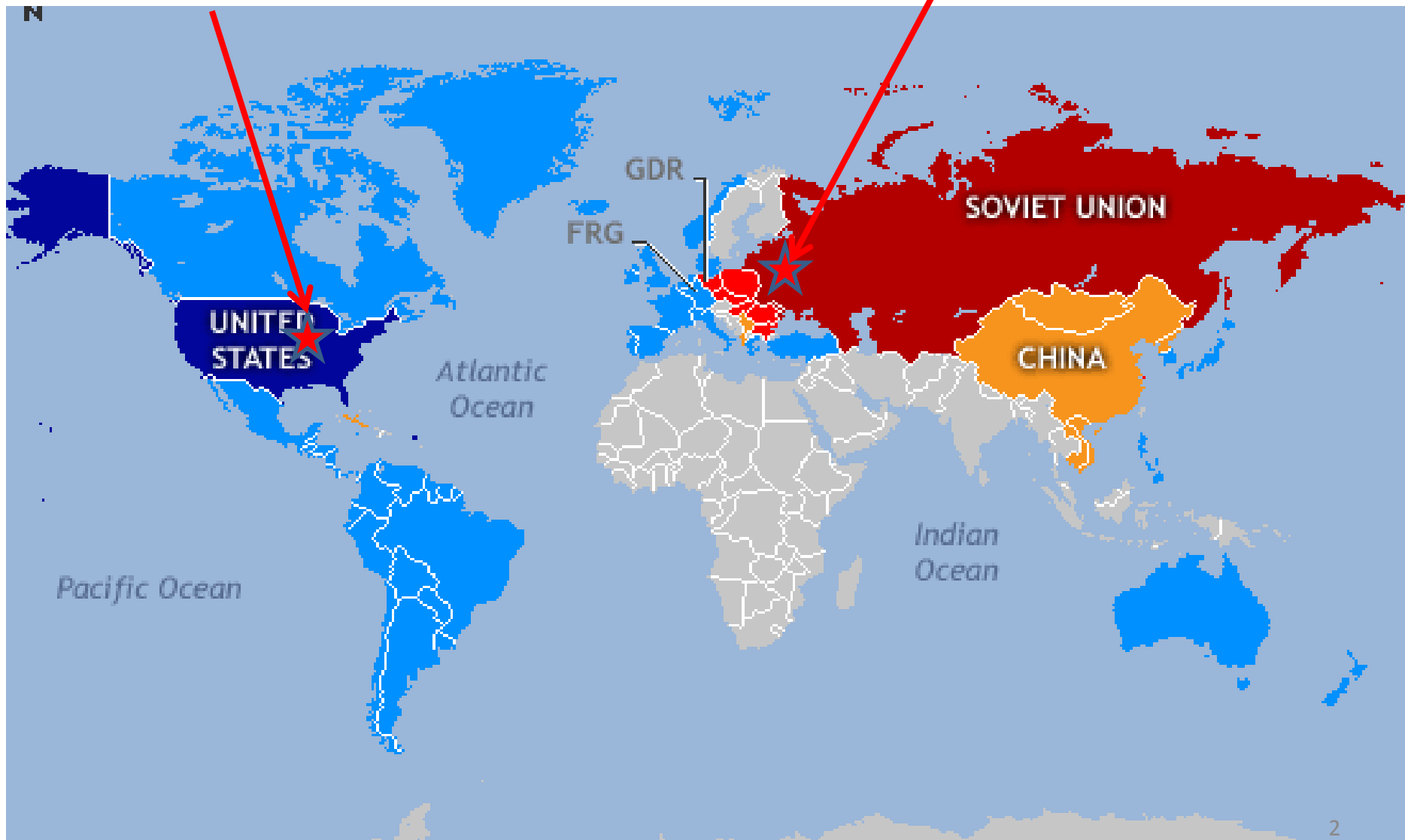
11 September 2016

World in 1970s

Batavia



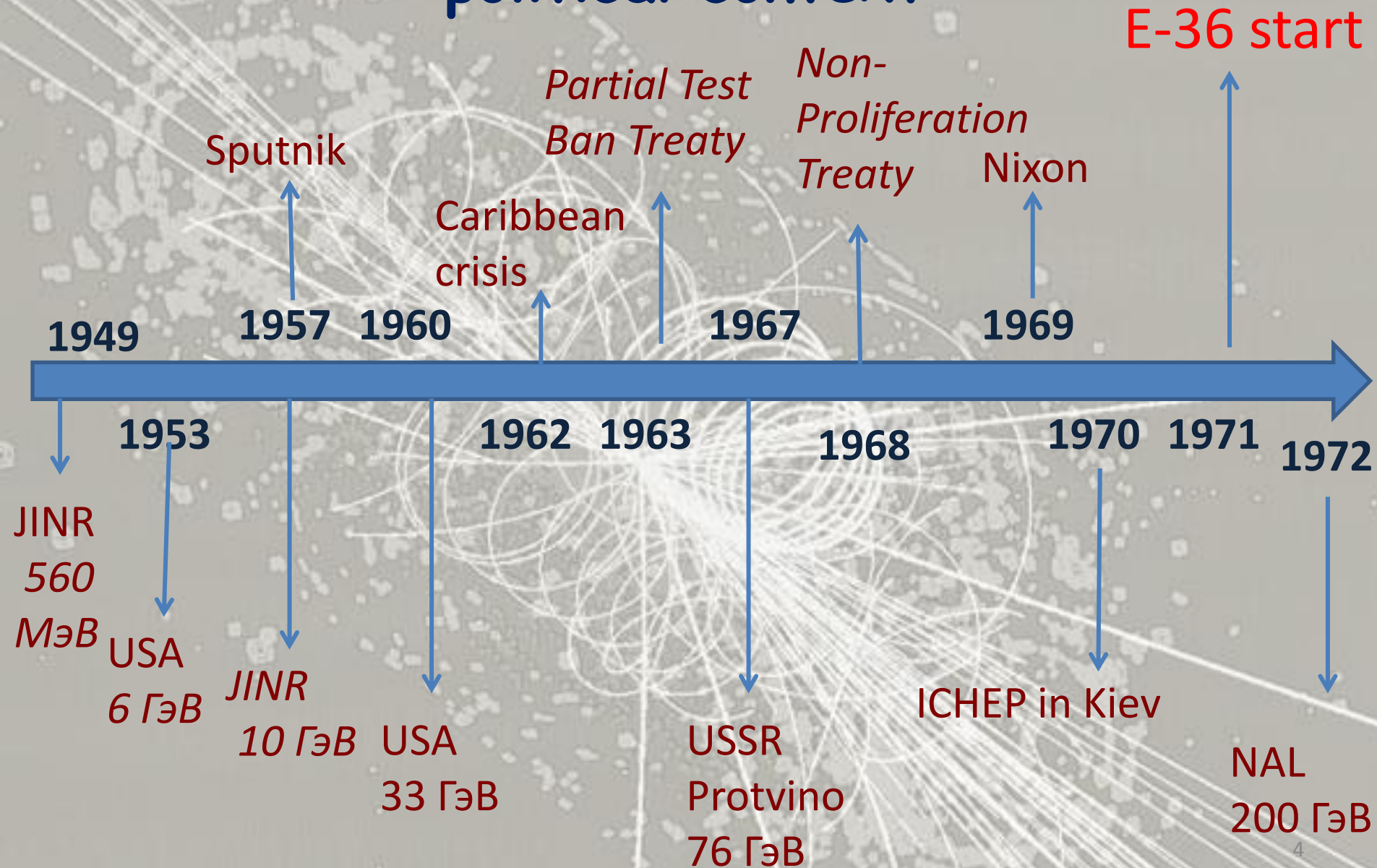
Dubna



Joint Institute for Nuclear Research (JINR), Dubna

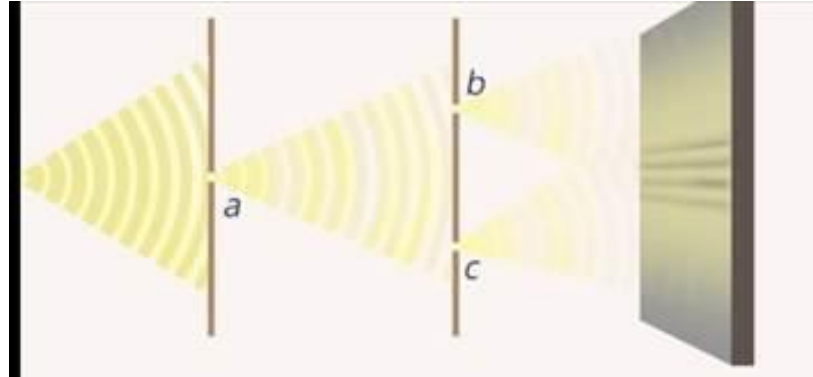


Accelerator race of 1950s-1970s and political context



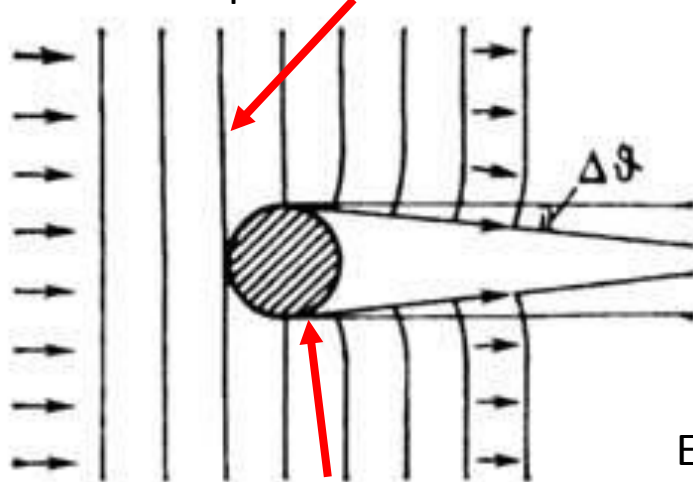
What did E-36 study?

Light diffraction (classical physics)



Diffractive scattering of hadrons

Accelerated protons

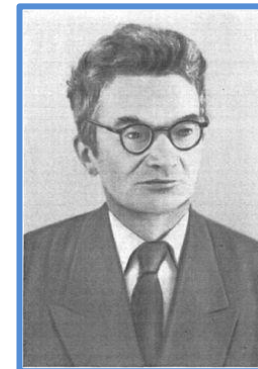


Gas-jet target protons



There was no QCD at that time!

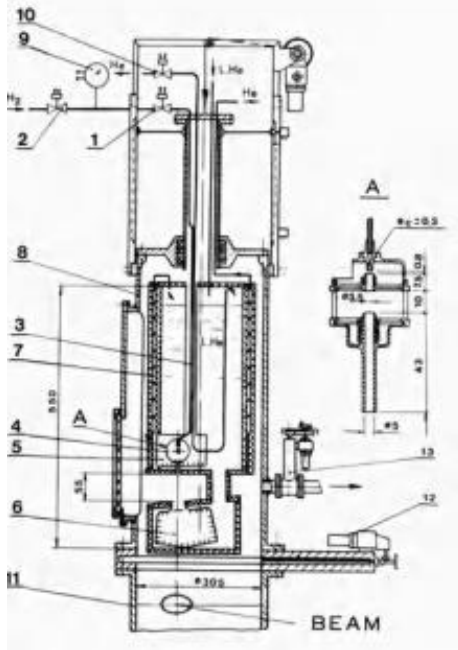
T.Regge



I.Pomeranchuk

Exchange of pomeron

Promising meeting at ICHEP



- The gas-jet target was used by the JINR group in Protvino at a 70-GeV proton beam.
- In 1970 results were presented at the XV Rochester Conference (ICHEP) in Kiev.
- Malamud and Nikitin meet and discuss the future experiment at NAL

The Dubna gas-jet target



E. Malamud



V.A. Nikitin



Kiev, 1970



Main Ring at NAL, \$250 M

Visit to R.Wilson

- Had to enlist R.Wilson's support
- The Cold War, travel was complicated in 1970.
- Computing conference
- Key event for E-36
- Glossy pictures of the gas-jet target
- "I am going to approve that"
- Colleagues to Malamud on the sidelines: "Russians are bad guys"



National Accelerator Laboratory
Founded in 1967.



R.Wilson and G.Seaborg

Preparations to the experiment

DUBENA TELEX - 10/14/71

GOOD MORNING. NIKITIN IS AT THE TELEX.
THE STATE COMMITTEE ON THE BASES OF INFORMATION GOT FROM U.S.
EMBASSY IN MOSCOW ABOUT BATAVA PROJECT STATUS HAS DECIDED TO
POSTPONE OUR GROUP DEPARTURE FOR U.S. UP TO DECEMBER. IF YOU
DISAGREE WITH THIS PLEASE APPLY TO ST. COM. FROM THE NEIME OF
A.E.C. I HAVE NO PROPER INFORMATION TO CHANGE THE SITUATION.
PLEASE INFORM TE ON THE STEPS WHICH YOU WILL MAKE. APPARATUS
ARE READY. WE ARE MAKING SOME IMPROVEMENTS THAT ARE NOT ESSENTIAL.
THE JET CONSISTING OF SINGLE SOLID PIECES OF HYDROGEN IS PRODUCED.
THE VACUUM CONCERNATION IS EXTREMELY GOOD.
PROBABLY THIS TARGET WILL SERVE FOR LARGE ANGLE MEASUREMENTS.

GOOD MORNING VLADIMIR. ERNIE IS AT THE TELEX. I WILL REFER
YOUR INFORMATION FROM STATE COMMITTEE TO DR. WILSON AND A.E.C.
AND COMMENTS WILL COME LATER. WE HAVE NO DETAILED INFORMATION
ON THE APPARATUS TO DISCUSS THIS WEEK EITHER BUT I FEEL THESE
WEEKLY CONTACTS ARE IMPORTANT AND WE SHOULD CONTINUE THEM.

ITLL RIGZ
ITLL RGHT

ATLL RIGHT
ALL RIGHT. XOROSHO.

THERE ARE LOTS OF PEOPLE AT THE TELEX THIS MORNING--STEVE,
CHIANG, GUILIANNOS, MR. GETZ. WE ALL SEND BEST WISHES.
GOOD BYE. WE WILL CALL YOU NEXT WEEK.

SPASIBO DO SWIDANIYA

Telex for US-
USSR
collaboration
first used by
D.Drickey-
E.Tsyganov
at Protvino

Checking texts

Telexes on
Thanksgiving

After 6 PM in
Moscow

Housing issues

The JINR group offers NAL the gas-jet target for \$80,000 to cover their living expenses. NAL is funding an alternative target.



Goldwasser to Nikitin, 21 April 1971: “During recent visit of *Dr. Petrosyants* [head of the USSR Committee for Atomic Energy] and other Soviet scientists to NAL...

A.M. Petrosyants



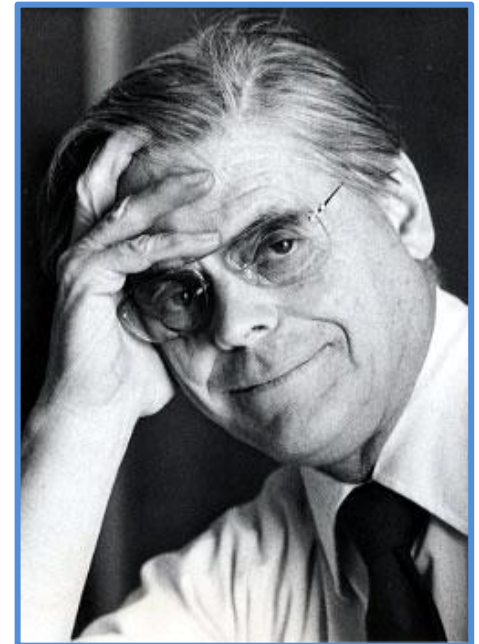
G. Seaborg

... we learned that *a major difficulty in completing your arrangements to collaborate in the p-p elastic scattering experiment was still the cost of housing for yourself and your group while living and working at NAL.* I am pleased to be able to tell you that at April 16 dinner in honor of *Dr. Petrosyants, Dr. Seaborg* [head of the US Atomic Energy Commission] stated that he was pleased by the prospect of the coming USA-USSR collaboration and that he was also pleased to announce that during the working visit of the Soviet scientists they *would be housed at or near the Laboratory as guests of the Laboratory.*”

Competing proposals



Ernest Malamud



Robert Wilson

- Proposals submitted: 1) E. Malamud (NAL) and V.A. Nikitin (JINR) (emphasis on elastic pp scattering), 2) A. Melissinos (Rochester) and R. Carrigan (NAL) (emphasis on inelastic scattering), 3) two more proposals (?) are mentioned in letters.
- Letter from NAL Deputy Director E. Goldwasser to I. Smolin of State Committee on Atomic Energy on 11 July 1972: “As you know, we had already received a proposal from an American group for a *similar experiment subsequent to the initial submission of the letter of intent by the USSR-USA collaboration, but previous to the submission of their final proposal.* We therefore had a serious problem to decide how best to proceed with the interesting physics experiment that is in question.”
- Proposals were merged, the spokesman “should not be a Russian”. Spokesman was Rodney Cool.
- R. Wilson approved the experiment bypassing Program Committee

List of Collaborators - Experiment #36A

a. Soviet Bloc

- Bartenev, Victor; JINR, Dubna
- Kuznetsov, Anatoli A.; JINR, Dubna
- Morosov, Boris A.; JINR, Dubna
- Nikitin, Vladimir A.; JINR, Dubna
- Pilipenko, Yuri; JINR, Dubna
- Popov, Vladimir V.; JINR, Dubna
- Zolin, Leonid S.; JINR, Dubna

b. Non-Soviet Bloc

Carrigan, Richard A.; Fermilab
 Chiang, I-Hung; Rochester University
 Cool, Rodney L.; Rockefeller University
 Goulianos, Konstantin; Rockefeller University
 Gross, Dan A.; University of Rochester
 Jostlein, Hans; University of Rochester
 Malamud, Ernest; Fermilab
 Melissinos, Adrian; University of Rochester
 Nihalani Mohan; Rockefeller University
 Nitz, David; University of Rochester
 Olsen, Stephen L.; University of Rochester
 Shapiro, S.; University of Rochester
 Strauss, Bruce; Fermilab
 Yamada, Ryuji; Fermilab

R.Carrigan's memorandum

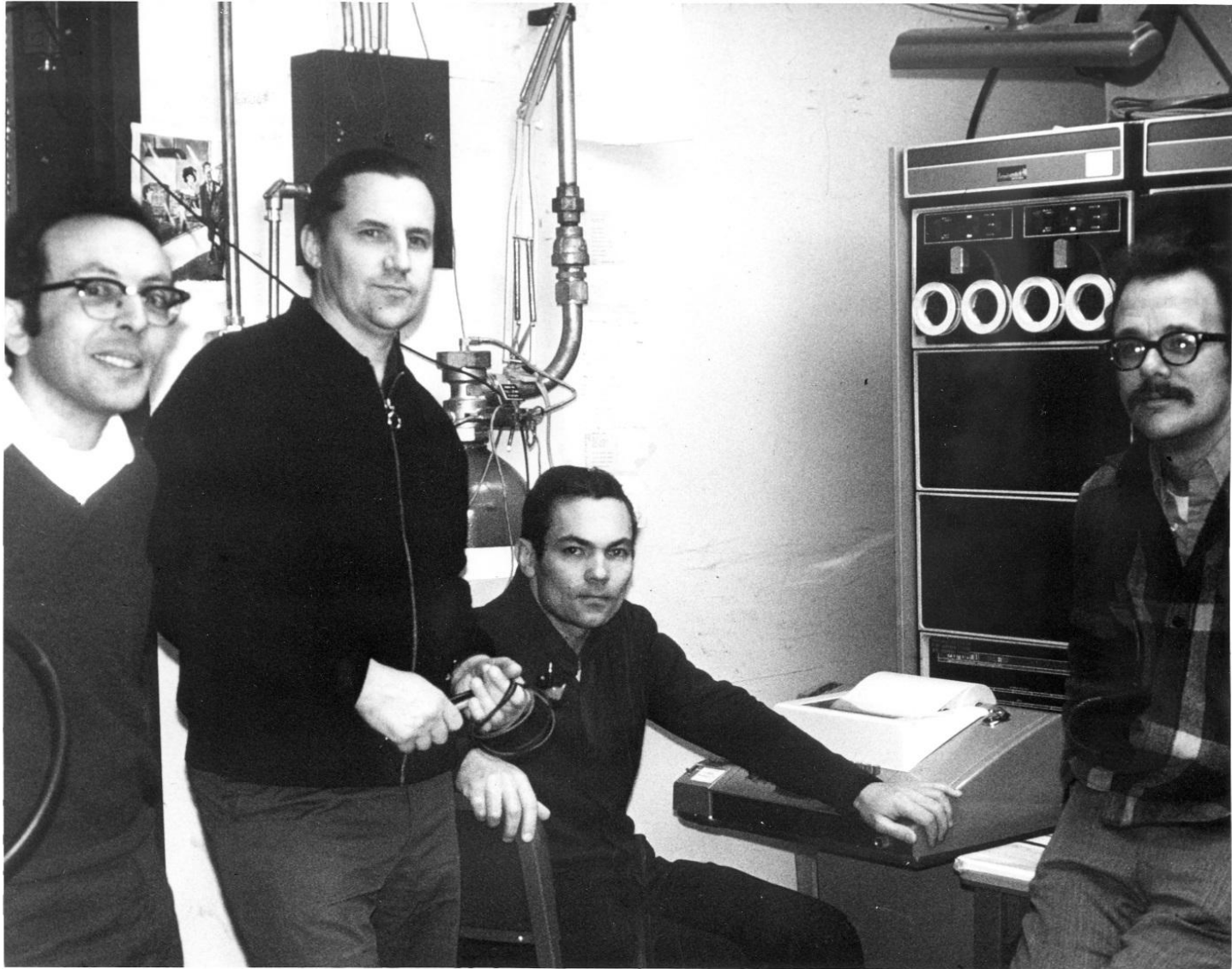
Companions:

Kuznetsovs – Carrigans
 Nikitins – Malamuds
 Popovs – Yamadas
 Zolins – Olsens
 Pilipenkos – Strausss
 Bartenevs – Chiangs
 Morozovs – Klens

“equality”: physicists to
physicists, managers to
managers

Companions picked them
 up at airport,
 helped to learn how to
 shop,
 assisted in buying used
 cars,
 entertainment

E-36 collaborators are at the experiment



Left to Right: E. Malamud, L. Zolin, V. Nikitin, S. Olsen, Date: December 1972

Life in the NAL Village

Children were left behind

Families almost did not speak English

25-mile “red tape”

NAL tried to find feasible jobs for wives, but State Committee did not support that

Spoke not only English but also Russian at work
(D. Gross, K.Goulianos)

R.Carrigan’s instruction: social program, English language groups for families, entertainment



Dubna, 1970



NAL Village

Diplomatic issues: NAL mediates between Soviet physicists and State Committee

Malamud to Goldwasser: *“I think it might be useful if you and Anatole Kuznetsov talked before the Petrosyants’s visit about such subjects as (1) **freer travel in U.S. for Soviets**, (2) “Home leave” for them, (3) visits here by children, (4) continuation of the experiment under improved conditions from the Russian point of view, etc. He feels he cannot go to you but that you must initiate such a conversation.”*



A. Kuznetsov



E. Goldwasser



A. Petrosyants

Scientists as diplomats



R.Sachs, Director of Enrico Fermi Institute, the University of Chicago

Robert Sachs of NAL Program Committee: ” we [should] keep open our channels of communication to those *influential individuals* in Russia who are most likely to help. For us, these are *the Russian physicists* [...] They are the ones on whom we must depend when we want to send *a message to the Soviet Union*. They are interested enough in international cooperation that they *will confront their government* when they see that our cooperation is at stake...”

Collaborators are discussing the experiment in the NAL Village



Left to Right: D. Gross, R. Carrigan, A. Kuznetsov, V. Bartenev, R. Yamada, L. Zolin, V. Nikitin, E. Malamud. Date: February 26, 1973

Conclusions



- E-36 ended in 1973.
- Gave birth to a chain of 5 experiments (ended ca 1977).
- Nixon-Brezhnev Agreement on US-USSR Cooperation in Research, Development and Utilization of Nuclear Energy (Fundamental Properties of Matter, Item 21) was signed in 1973.

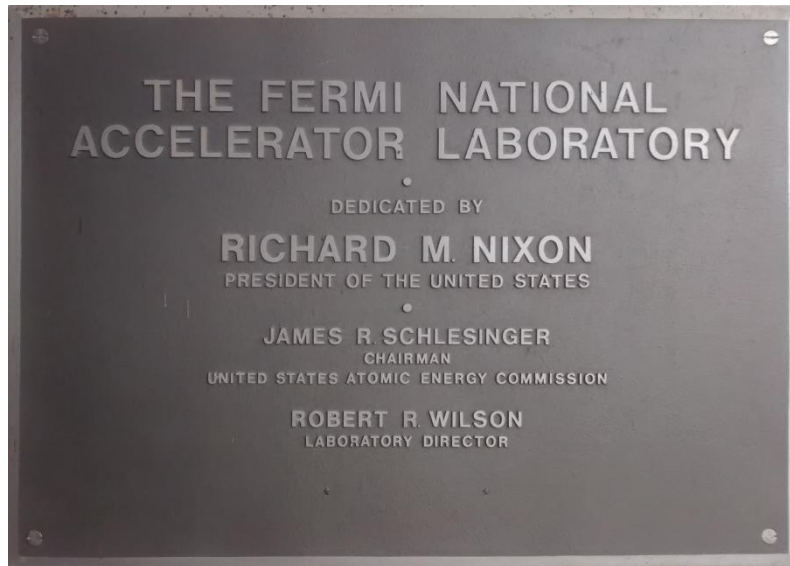


Table to Fermilab from Dubna collaborators



Acknowledgements

I am indebted to

*Richard Carrigan,
Konstantin Goulianos,
Dan Gross,
Ernest Malamud,
Adrian Melissinos,
Stephen Olsen,*

*Vladimir Nikitin,
Ryuji Yamada,
Nikolai Mokhov,
Valerie Higgins*

for useful discussions.